

books, the second contains a chapter on the chemical properties, more especially with regard to the problem of the classification of species; the third contains several articles which have not previously found their way into text-books of mineralogy (pp. 228-41); they relate to the crystalline form and physical properties of "solid solutions," and are especially useful in the discussion of the feldspars; the fourth contains a chapter on the determination of minerals, and affords many useful and practical hints suggested by a long experience.

The first book is by far the longest, and is itself divided into two nearly equal sections; the first (98 pages) deals with the geometrical properties of crystals, the second (81 pages) with their physical properties. It may be objected that it is impossible to give to the student, within the compass of 98 pages, an adequate idea of the theory of crystallography, but it must be remembered that, in a work on mineralogy, minute crystallographic detail would be out of place; such detail is already given to the student in the special treatises of Prof. Maskelyne ("The Morphology of Crystals"), of Prof. Lewis ("A Treatise on Crystallography"), and of Mr. Hilton ("Mathematical Crystallography and the Theory of Groups of Movements"). What the mineralogical student requires is a brief sketch of the whole subject to enable him to grasp the general bearings; this the author has given, and it is all that should be expected from him. It may be mentioned that the author has sought to bring about uniformity of nomenclature of the thirty-two classes of symmetry by coming to an understanding with Prof. E. S. Dana, the editor of the well-known "System of Mineralogy"; but notwithstanding their agreement we find it difficult to reconcile ourselves to a nomenclature which compels one to say that a crystal of cinnabar (HgS) belongs to the quartz class; the systematic nomenclature suggested on p. 280 seems more full of promise. Attention may be directed to the form of student's goniometer, as improved by the author, which is figured on p. 101, and also to the convenient goniometer designed by him for fixing on the stage of a microscope (p. 178).

The chapters treating of the optical properties (70 pages) will probably be the most generally appreciated by students, owing to the great use made of these properties in the determination of the mineral constituents of rock-sections by means of the polarising microscope. It gives to the student a sufficiently precise sketch of the subject without entering into mathematical discussions, and proves once more that it is possible to give to the student an idea of the optical characters of biaxial crystals without any unsatisfactory hypothesis as to optical elasticity and its variability with crystallographic direction.

Part ii., which gives a description of the more important mineral species, is subdivided merely into sections dealing with the various mineral groups. It differs from other works of a similar kind in that it is in great part readable, instead of being a mineralogical dictionary. The readable part and the dictionary part are kept quite distinct from each other, both in position and in the size of type. Further, there

is no attempt to give long lists of localities; these are left to be sought for in the books of mere reference; the author is satisfied, and doubtless the student will be satisfied, with descriptions of specimens from the more noteworthy localities, and with accounts of the more important modes of occurrence, and of these we think the author has made a judicious selection. As for the readable portion, it is full of interesting and valuable information.

The author has a simple and pleasant style which attracts the reader, occasionally relieving the technicality with a touch of the driest humour, as, for instance, when he finds it convenient (p. 350) to treat dihydric oxide as a member of an anhydrous series.

The English student of crystallography and mineralogy is to-day in a happy position as compared with his forerunners; his path is continually made more and more easy by the publication of excellent text-books; but there will long remain sufficient inherent difficulty to prevent these subjects of study from losing their educational value, and, as regards research, the recent discovery of radium in the long-known mineral pitchblende shows that the statement made by the alchemist several centuries ago is still true—"a man may consume his whole life in the study of a single mineral without arriving at the knowledge of all its qualities."

#### SCHOOL MATHEMATICS.

*A Junior Geometry.* By Noel S. Lydon. Pp. vi+171. (London: Methuen and Co., 1903.) Price 2s.

*Technical Arithmetic and Geometry.* By C. T. Millis, M.I.M.E. Pp. xiv+254. (London: Methuen and Co., 1903.) Price 3s. 6d.

*The Modern Arithmetic for Advanced Grades.* Woodward Series. By Archibald Murray (Harvard). Pp. 464. (St. Louis: Woodward and Tiernan Printing Co., n.d.)

*The Junior Arithmetic, being an Adaptation of the Tutorial Arithmetic, suitable for Junior Classes.* By R. H. Chope, B.A. Pp. viii+363. (London: W. B. Clive, 1903.) Price 2s. 6d.

MR. LYDON'S book, which is meant for young pupils, has many good points and a few bad ones. Like many other very recent books on geometry, it ignores Euclid's order, method, and language. In this way it appeals more readily to the understanding of the pupil than the orthodox Euclidean works do; but the definition "a straight line is one which lies 'evenly' between its extreme points," and the words "notice that the line you have ruled lies evenly between its extreme points A and B," show a strong conservatism. The pupil will indeed be clever if he can give a clear indication of the thing which he notices. The use of the terms *vertical* and *horizontal* in the following manner must be very strongly condemned:—

"When a straight line is drawn upright on the paper it is called a *vertical* line, when drawn in a slanting direction it is called an *oblique* line, and when drawn level on the paper it is called a *horizontal* line."

Early teaching of this kind is responsible for the flagrant misuse of the terms *vertical* and *horizontal*

which is so frequently exhibited by draughtsmen and students of engineering.

Again, the definition of an angle—"an angle is the difference in direction of two lines drawn from a point"—has nothing really quantitative about it, and should be used rather as a familiar *description* than as a quantitative definition.

After the definition of parallel lines—"parallel lines are such as are the same distance apart throughout their whole length"—we have the warning "be careful to distinguish between parallel and horizontal," which unintelligibility is, doubtless, in some way connected with the strange conception of *horizontal* above noticed.

We are now done with the blemishes; for the rest we have nothing but commendation. The book is divided into a series of lessons, each of which is followed by several exercises in the copying of various figures and patterns on squared paper, accompanied by arithmetical calculation. The little pupil is led easily into the subject, and he meets with nothing like severe reasoning until lesson vii. is reached. The grouping of propositions and constructions is throughout very good, and the chapters on areas particularly excellent. The most useful propositions of Euclid's books ii. and iii. are included, and the concluding lessons deal with loci, ratio and proportion, similar figures, &c., and include a large number of important problems, theorems, and constructions. This portion of the book (the most important) can scarcely be improved upon and, indeed, for this part of the subject, we do not know of any work for beginners which deserves higher commendation.

The book by Mr. Millis can be very strongly recommended as one the study of which should go hand in hand with that of books on purely deductive geometry. It begins with the definitions and figures of geometry, and the use of instruments for the solutions of the problems which are usually treated of in geometrical drawing. Then follows the treatment of fractions, vulgar and decimal, their nature being explained and illustrated by geometrical construction. Contracted methods of multiplication and division are explained. The nature of ratio and proportion follows, and then the enlargement and reduction of figures, square root, propositions relating to areas—in the whole of which work arithmetic goes hand in hand with geometry. After the usual figures of elementary plane geometry are dealt with, conic sections and irregular curvilinear figures are taken, and their properties illustrated by arithmetical examples, with the use of squared paper. Simpson's rule and Henrici's method are explained. The last third of the book deals very fully with the mensuration of solids.

The pupil who uses this work will receive a thorough drilling in neat and accurate drawing—a thing which was very much needed when Euclid held sole sway in the schools.

Mr. Murray's book is a sequel to the work which we noticed some months ago. It is meant for teachers, inasmuch as no answers are given to the various questions. Comparing the work with either of the two books on arithmetic now noticed, it would appear that

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in the American schools the subject is taught in a very leisurely manner, since there is nothing of a very advanced nature in this work, and a great deal of the mere elements is included. This, of course, may in the end make for thoroughness. It seems somewhat strange that addition and subtraction of decimals are employed in the beginning (p. 31, &c.), while the subject of decimals is subsequently taken (p. 127, &c.) and treated *ab initio*.

Arithmetic and a certain amount of elementary algebra go hand in hand in the book—an arrangement which makes things simple for the beginner; but the purpose of several pages on very elementary algebra at the end of the chapter on percentage is not clear.

The metric system is, of course, explained and illustrated, but the large amount of space devoted to English weights and measures, with their antediluvian lawlessness and complexity, induces sad reflections on the utter waste of time which we impose upon our youth.

The chapter on "Computations and Approximations" contains a useful exposition of the use of squared paper for the plotting of curves and the determination of missing values by graphic interpolation. As compared with our English works, the most striking characteristic of this book is, perhaps, the absence of complexity and useless difficulty in the various examples. It is a merit of the author that he is very particular about the accurate use of language—a great desideratum in these days of slipshod writing, when English grammar and a logical arrangement of thought are steadily vanishing from our scientific treatises.

Teachers everywhere will find the work very helpful and suggestive for a natural and logical way of teaching the subject to young pupils, inasmuch as the methods employed are the result of many years' practical experience in the work of instruction.

Mr. Chope has prepared a treatise of the usual kind on arithmetic. It contains a very large collection of examples illustrating the various rules, and is just as good a handbook of the subject as the student can desire.

#### THE NEURONE THEORY.

*Die Neuronenlehre und ihre Anhänger.* By Dr. Franz Nissl. Pp. vi + 478. (Jena: Gustav Fischer.) Price 12 marks.

ONE approaches this work with rather mixed feelings. While there is no doubt that an exhaustive survey of our present knowledge in any branch of science is certain to well repay the investigator, yet a book of the magnitude of the one now under consideration, which contains only a controversial view of already known facts, without introducing anything beyond what is familiar to us, leaves on the mind of the reader something of a feeling of weariness, and a suspicion that the same amount of labour would have been better expended in quarrying fresh knowledge rather than reshaping the blocks that have been already brought out. The author himself has realised this, and in the preface gives the reasons which induced him to give the present form to the